

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Andreas Bacher et al.

Serial No.: 10/618,936

Filed: July 14, 2003

For: SILANE-CONTAINING POLYVINYL ALCOHOL FOR COATING SLIPS

Attorney Docket No.: WAS 0595 PUS

Group Art Unit: 1796

Examiner: Vickey Marie Nerangis

REPLY BRIEF UNDER 37 C.F.R. § 41.41

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Sir:

This Reply Brief is in response to the Examiner's Answer mailed on July 2, 2009 for the above-identified patent application.

The subject invention is directed to silane-modified polyvinyl alcohols containing 1-methylvinyl acetate moieties, the silane being present in an amount of from 0.01 to 1 weight percent.

The Examiner, in her Answer, has made several statements with which Appellants respectfully disagree, and therefore wish to comment on these inaccuracies. This application has been appealed once before, but the scope of the present claims is greatly narrower and the Declaration of Dr. Bacher was not of record during the appeal.

On page 4 of the Answer, ¶ 2, the Office indicates that *Schilling* discloses that "any suitable additional monomer" could be used, citing *Schilling* at column 2, lines 45-46. This is somewhat of a mis-statement of *Schilling* who does not state that any comonomers may be

used, but merely says "other polymerizable monomers." (Column 2, lines 45-46.) Silane-modified polyvinyl alcohols are much more hydrophobic than conventional polyvinyl alcohols. At column 3, line 57, to column 4, line 2, *Schilling* indicates that if a more hydrophobic copolymer is desired, long chain vinyl esters or ethylene can be copolymerized. The addition of silane groups via unsaturated silanes was known long before *Schilling*'s invention. For example, *Maruyama* was first published in 1983, some four years before *Schilling*, and yet *Schilling* did not even mention unsaturated silane comonomers to increase hydrophobicity. Why is this so? The answer, as indicated by the Bacher Declaration, is that those skilled in the art knew about the instability of silane-containing polymers (Bacher Declaration, page 2, last ¶). The "other" monomers to which *Schilling* was referring to are the conventional comonomers known to those skilled in the art, such as vinyl chloride, styrene, acrylate esters, etc. There is no indication that *Schilling* contemplated unsaturated silane comonomers, and every reason to believe that he did not.

Second, on page 5 of the Answer, the Office contends, as Appellants understand this argument, that one would be motivated to employ isopropenyl acetate (1-methylvinyl acetate) in *Maruyama* for the purpose for which *Schilling* applied it — a different problem than that addressed by Appellants. Citing *In re Linter*, 458 F.2d 1013, 173 USPQ 560, 562 (CCPA 1972), the Office (correctly) states that addition of an ingredient to a composition for a different purpose does not alter a conclusion of obviousness. In other words, the fact that an Applicant has added an ingredient to solve a specific problem is not relevant to the obviousness inquiry if the prior art added it to the same composition but for a different purpose.

However, that is not the case here. The polyvinyl alcohol of *Schilling*, in which isopropenyl acetate moieties are incorporated, is not the same as the silane-modified polyvinyl alcohols of *Maruyama*. This is not a question of adding isopropenyl acetate comonomers to the same polyvinyl alcohol polymers for two different purposes, as in *Lintner*. Rather, the isopropenyl acetate would be added to two entirely different polymers: a conventional polyvinyl

alcohol polymer (*Schilling*) and a silane-modified polyvinyl alcohol (*Maruyama*), as well as for a different purpose. These respective polymers have different chemical makeup and entirely different properties, as shown in the subject application, as attested to by the *Bacher* Declaration, and as well known to the art.

For example, conventional polyvinyl alcohols exhibit pigment shock (*Schilling*, col. 2, lines 17-24), while the *Maruyama* silane-modified polyvinyl alcohols do not (*Bacher* Declaration, page 2, ¶ 4). Conventional polyvinyl alcohols are not known to have any gelling problem, or suffer from viscosity increase in aqueous solutions, but the *Maruyama* polymers do (*Bacher* Declaration, page 2, last ¶).

Hence, this is not a situation as in *Linter*, where sugar was added to the same composition but for different purposes. Rather, the situation here is that the isopropenyl acetate comonomer is employed for a different purpose and in different compositions.

It must be strenuously emphasized that the purpose of *Schilling* in using isopropenyl acetate comonomers was two fold: to increase the solubility rate,¹ and to avoid pigment shock. Here, there is no evidence of record supplied by the Office that the *Maruyama* silane-modified polyvinyl alcohols have any dissolution rate problem², nor would there be any expectation or predictability that this is the case, because the *Maruyama* copolymers are so different from the *Schilling* copolymers due to the former's silane content. There is simply no evidence that the *Maruyama* polymers have the problem the *Schilling* polymers had. Thus, there would be no reason for the skilled artisan to modify the *Maruyama* polymers to solve a problem which does not exist.

¹ This problem of *Schilling* will be discussed further below. *Schilling* did not add isopropenyl acetate to increase solubility!

² See also the *Bacher* Declaration in this respect.

With regard to pigment shock, the situation is the same. Why would one modify a silane-containing polyvinyl alcohol polymer to reduce pigment shock when the polymers do not exhibit pigment shock (Bacher Declaration, page 2, ¶ 4). Again, there would be no reason to add another monomer to solve a non-existent problem.

The Answer alleges a solubility problem for conventional polyvinyl alcohols and equates this with viscosity stability. This is totally incorrect. First, polyvinyl alcohols, whether containing isopropenyl acetate-derived moieties or not, do not have a solubility problem. Due to the huge number of pendent hydroxyl groups in polyvinyl alcohols, these polymers are miscible with water in all proportions. A solid polyvinyl alcohol polymer will absorb water from the atmosphere, and aqueous solutions containing just greater than 0% polyvinyl alcohol all the way up to just shy of 100% polyvinyl alcohol are all stable. Their solutions will not, as the Office alleges, precipitate polyvinyl alcohol.

However, as indicated by *Schilling*, conventional homopolymeric polyvinyl alcohols do have a solubility rate problem. They dissolve very slowly at room temperature, unless of low molecular weight, and hence are ordinarily dissolved in water at higher temperatures and then cooled, just as sugar dissolves more rapidly in hot water rather than cold water. The polyvinyl alcohol will not precipitate upon cooling — it is miscible with water in all proportions. Rather, it just takes more time for it to dissolve at lower temperatures. An 80% polyvinyl alcohol solution prepared by dissolving polyvinyl alcohol in water at 25°C will be just as "stable" as an 80% by weight polyvinyl alcohol polymer dissolved at 70°C, however dissolution of the former will take longer. *Schilling* added isopropenyl acetate to reduce the dissolution rate, not any solution instability.

Silane-modified polyvinyl alcohols have no such dissolution rate problems, and the Office has provided no evidence that any such problems exist. Therefore it would not be

obvious to prepare a copolymer of vinyl alcohol, isopropenyl acetate, and unsaturated silane to provide an increase in dissolution rate, as again, this problem is not known to exist.

Relative to page 7 of the Office Action, ¶ 1, the *Schilling* copolymers do not have a gelling or viscosity instability problem. There is no disclosure in *Schilling* which even mentions such problems. However, the silane-modified copolymers of *Maruyama* are known to have gelling and viscosity instability, as indicated by *Bacher* and evidenced by the subject application comparative example, a *Maruyama* silane-modified polyvinyl alcohol polymer with ca. 0.5% silane moieties. There would be no reason for *Schilling* or anyone else skilled in the art to use silane monomers in his polymer, because the conventional wisdom in the art was that to do so would cause an additional problem: that of gellation.

Moreover, if *Schilling* or one skilled in the art were, for some reason, motivated to add silane comonomers in preparing polyvinyl alcohols, one would also eliminate the isopropenyl acetate taught by *Schilling*. Why is this so? The reason is that while isopropenyl acetate, as taught by *Schilling*, minimizes dissolution rate and pigment shock properties, these problems are not known to exist in *Maruyama*-type polymers. Why add an additional comonomer, adding all of increased process complexity, increased process cost, and increased product cost, for no perceived benefit. The answer is clear: one would not do so.

The Office has disregarded these clear economic disincentives, citing *In re Farrenkopf*, 713 F.2d 714, 219 USPQ 1 (Fed. Cir. 1983). However, *Farrenkopf* does not stand for this proposition as represented by the Office. In *Farrenkopf*, the claims were directed to a method of increasing the stability of an angiotensin I standard solution by adding a phenylmethylsulfonyl fluoride inhibitor. The instability of the angiotensin I solutions was well known. The use of inhibitors was also well known. The Appellant argued that solely for economic reasons, one would have sought another method of stabilization rather than use an expensive inhibitor. The Court stated:

We agree with the Board that additional expense associated with the addition of inhibitors would not discourage one of ordinary skill in the art from seeking the convenience expected therefrom.

Farrenkopf at 716, 214 USPQ at 4 (emphasis added). Note the emphasized portion cited above. What *Farrenkopf* states is that when there is a perceived benefit, the additional cost may be justified.

Here, however, there is no perceived benefit to incorporating isopropenyl acetate into silane-modified polymers. These polymers are not known to suffer from pigment shock, nor to have any dissolution rate problems. Nor was isopropenyl acetate known to reduce the propensity of silane-modified polyvinyl alcohols to gel or to increase their solution viscosity with time. Thus, there was "no convenience expected therefrom" in the words of *Farrenkopf*, and one skilled in the art simply would not have been motivated to make the proposed combination. The fact that isopropenyl acetate negates the gelling problem of *Maruyama*-type silane-modified polyvinyl alcohols is Appellants' discovery, not *Schilling's*, not *Maruyama's*, and certainly not a combination thereof.

Patents are commercial instruments. The Constitution recites the purpose of patents to be to "promote the Progress of Science and the Useful Arts". This clause reflects economic realities which are well established, particularly in the present "dog eat dog" world of national and international commerce. The goal of every manufacturer is to make products better or cheaper, or preferably both, in order to garner market share, sell more product, and make more profit. No one would take an existing product, add additional processing steps or additional ingredients, particularly more expensive ingredients, only to result in a product which is more expensive but of no greater value than the products of competitors or their own prior products. This would be economic suicide. There is no case known to Appellants which states as a broad proposition that economic incentives or disincentives are not relevant to patentability.

Farrenkopf does not so state; he limits the economic factor to cases only where there is a perceived benefit which justifies the cost. See, e.g. *Merck & Co. Inc. v. Olin Mathieson Chemical Corp.*, 253 F.2d 156 (CA 4 1958), where the "cheapness" of Applicant's new synthetic B vitamin was cited by the court in assessing non-obviousness.

In the Answer, the Office has criticized the Declaration of Dr. Bacher in several respects.

First, the Answer indicates (page 7, last ¶) that "the inventive examples contain only vinyl triethoxy silane for the 'silane-containing, ethylenically unsaturated monomers'", characterizing this as not being commensurate with the scope of the claims. This is error.

First, two different silanes are used, vinyltriethoxysilane (Example 1) and vinylmethyldiethoxysilane (Example 2). The viscosity stability was the same in each case — outstanding, whereas the comparative example (*Maruyama* silane-modified polyvinyl alcohol from *Maruyama's* employer) exhibited more than a three fold viscosity increase.

Second, the Bacher Declaration indicates that there is no scientific reason to believe that the same results would not be achieved with other compositions (Bacher Declaration, ¶¶ 9, 10, and 11).³

Moreover, in the prior appeal, the range of alkylvinyl esters was broad, whereas here the claims include only isopropenyl acetate, and the mol percentage of silane comonomer

³ On page 6, lines 1 and 2, the Office states that "Schilling et al teaches that its invention improves upon solubility which is an indicator of storage stability since precipitation out of solution is a type of storage instability." As indicated previously, *Schilling* includes no such teaching. *Schilling* is directed to improving the rate of dissolution so that dissolving can take place at lower temperatures. There is no solubility problem with polyvinyl alcohols, which are miscible with water.

was also broad, 0.01 to 10 weight percent, whereas the present claims recite 0.01 to 1 weight percent. The Examples/Comparative Examples are squarely within the claimed range and are commensurate with the scope of the claims, particularly in view of the comments of Dr. Bacher in his Declaration. The testimony of Dr. Bacher as one skilled in the art cannot be discounted. Dr. Bacher is not testifying as to opinions or unsupported conclusions, but to what he, as one skilled in the art, knows.

Finally, the Answer alleges that the comparative examples are not side by side examples because the relative amount of methylvinyl acetate comonomer in POVAL® R-1130 is not given, and the % of vinyltrimethoxysilane in mol percentage cannot be calculated. The POVAL® polymer is a *Maruyama* polymer, manufactured and sold by *Maruyama's* employer, Kuraray. It does not contain any methylvinyl acetate — that is Appellants' invention. The polymer is a polyvinyl alcohol/vinyltrimethoxysilane copolymer which contains 0.55 weight percent of vinyltrimethoxy silane monomer residues, as indicated in the Bacher Declaration. This polymer is believed to be highly similar if not identical to the polymer synthesized in *Maruyama* Example 1. This is a side-by-side comparison.

The claimed invention is narrowly focused and the copolymers claimed have achieved surprising and unexpected results. No prior art reference teaches or suggests forming a polyvinyl alcohol copolymer containing silane and 1-methylvinyl acetate moieties, and one skilled in the art would not be motivated to do so. The *Maruyama* polymers have art-recognized deficiencies, but the prior art does not suggest how to remove these deficiencies. Moreover, the problems addressed by *Schilling* are not relevant to silane-modified polyvinyl alcohols where these problems are not known to exist.

Reversal of the rejections of record is respectfully solicited.

Respectfully submitted,

Andreas Bacher et al.

By: 

William G. Conger
Registration No. 31,209
Attorney for Appellants

Date: August 19, 2009

BROOKS KUSHMAN P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075-1238
Phone: 248-358-4400
Fax: 248-358-3351